AMENDMENTS TO THE SPECIFICATION

The paragraph beginning on page 5, line 27 has been changed as follows:

Now referring to FIG. 3, a spacecraft attitude control system architecture, generally indicated at 62, includes ~~a star tracker~~ one or more star trackers 54, and may also include inertia measurement units 64, as well as solar array current sensors 66 that provide inputs to a spacecraft control processor 68. The spacecraft control processor 68 may be used to command many spacecraft systems such as, for example, a spot beam pointing mechanism 70, a crosslink pointing mechanism 72, a pitch/yaw magnetic torquer rod 74, a roll magnetic torquer rod 76, and a set of four or more reaction wheels 78 (that may be arranged in a pyramid configuration) by providing commands for wheel torque and/or wheel speed. In addition, the spacecraft control processor may provide commands to a solar wing positioner (SWP) and solar wing drive 80, as well as thrusters such as, for example, a liquid apogee motor engine 82, bipropellant thrusters 84, and bipropellant latch valves 86.

The paragraph beginning on page 6, line 28 has been changed as follows:

With reference to FIG. 4, a control software system may include computer software units (CSUs) such as star tracker processing (STP) CSU 88[)], that provides input to both a star measurement and steering (SMS) CSU 90 and a stellar attitude acquisition (SAA) CSU 92. The SMS CSU 90 provides input to a pre-kalman processor (PKP) CSU 94, and the SAA CSU 92 and the PKP CSU 94 both provide input to an attitude determination (ATD) CSU 96.

The paragraph beginning on page 7, line 29 has been changed as follows:

Now referring to FIG. 7, a flow diagram for providing three-axis stabilized control during a coasting operation in a bi-propellant transfer orbit is generally indicated at 138. At block 140, the spacecraft angular momentum unit vector, $\vec{m}$, is determined in earth centered inertial (ECI) coordinates. At block 142, the designated spacecraft spin axis $\vec{z}$, is determined, also in ECI coordinates. The designated spacecraft spin axis can be any axis in the spacecraft body, but is usually the z-axis or x-axis in a typical spacecraft mission. Next, at block 144, a set of allowable power safe attitudes is determined, for example, attitudes having a sun polar angle of 90 ± 20 deg. Next, at block 146, a steering attitude, q_{cmd}, is determined. ~~by finding~~ q_{cmd} is the attitude ~~that has~~ for which the spin axis is aligned as closely as possible with the momentum vector in ECI coordinates, but ~~within a power safety constraint of~~ constrained to being ~~within~~ in the set of allowable power safe attitudes, A. I.e., if we define ${}^{ECI}\vec{z}$ to be the designated spacecraft spin axis, as determined in the ECI frame, assuming a spacecraft attitude of q_{cmd}, then q_{cmd} is the attitude which satisfies:

$$q_{cmd} : \cancel{\min}\, \max\left(\left\langle \bar{m}, \frac{ECI}{\quad}\bar{z} \right\rangle\right) \quad \text{such that} \quad q_{cmd} \subset A$$

where ~~the~~ <. , .> is a mathematical symbol for the inner product or dot product of two vectors.

If power safety can be maintained, the steering law of $q_{cmd} : \cancel{\min}\, \max\left(\left\langle \bar{m}, \frac{ECI}{\quad}\bar{z} \right\rangle\right)$ the spacecraft 30S will have a steering attitude such that the designated spin axis is aligned with the momentum vector. The control law will command wheel momentum in a direction

which is perpendicular to both the designated axis and the momentum vector (i.e., $\vec{m} \times \overset{ECI}{\longrightarrow} \bar{z}$ direction) to bring the two vectors to be co-aligned. This is the 3-axis stabilized version of the existing GWANC control law.

The paragraph beginning on page 9, line 7 has been changed as follows:

The above steering law is merely an example, with more steering laws introduced below. The steering law can be derived by ~~maximizing~~ optimizing the reaction wheel momentum storage ~~duration with~~ capability, given a steering attitude within the power safe attitude set. This will lead to placing the spin axis to where the environmental torque effect is a minimum and the reaction wheel pyramid has the maximum margin for momentum storage. The momentum accumulated due to environmental torques may be dumped whenever necessary in the subsequent reorientation or burn maneuvers. The steering attitude can be optimized to be closer to the next LAM burn attitude to reduce next reorientation time and fuel consumption for the next LAM burn. This steering law may be used to place the coasting attitude as close as is practical to the next burn attitude as possible. The steering attitude may be set to maximize the difference between the power received by the solar panel and the power consumed by heaters, or to minimize power received by solar panel minus power consumed by heaters minus power consumed by the reaction wheels 78). The steering attitude can also be an optimization of the combination of the aforementioned objectives. In general, the optimal steering attitude may not be fixed over time, and may be a time-varying attitude trajectory.

The paragraph beginning on page 11, line 18 has been changed as follows:

To provide a power safe, 3-axis stellar attitude acquisition for the wing-deployed spacecraft 30D (solar wings 50 deployed, without the need of a sun sensor assembly (SSA)), a stellar attitude acquisition ~~mode~~ procedure may simultaneously perform a slow rotisserie maneuver for power safety and ~~use~~ using STA attitude acquisition to acquire the spacecraft attitude. When the wing is deployed, a simple rotisserie maneuver at an appropriate rate along any axis perpendicular to the wing-rotation-axis can maintain power/thermal safety indefinitely (momentum safety can also be assured provided a solar tacking algorithm is in place). For non-XIP spacecraft, with the potential of high momentum due to faulty thruster stuck-on (an event classified as highly improbable in failure mode analysis), the reaction wheels 78 may be saturated if there are only 3 reaction wheels left, and a ~~GWANC-like~~ WGWANC-like controller is needed. The ~~GWANC-like~~ WGWANC-like controller may align the spacecraft momentum vector with the ~~z-axis~~ spacecraft spin axis and reaction wheel momentum bias can be commanded in the same direction to reduce the spin rate to suit stellar attitude acquisition.

The paragraph beginning on page 13, line 20 has been changed as follows:

Let $\vec{u}_n$ and $\vec{u}_s$ be the normal unit vectors for north and south solar panels, and let ~~Imax~~ $I_{\max}$ be the panel current when the sun is perfectly normal to the panel, then, the predicted north panel current is $I_n = I_{\max}(\vec{u}_n \cdot \vec{s}_B)$, and the predicted south panel current is $I_s = I_{\max}(\vec{u}_s \cdot \vec{s}_B)$.